3-hour reports from small areas the telegraph will answer in many cases. In others it seems likely that the telephone will have to be used. But for the hourly reports from stations on the airways there must be a communications system that is not subject to use by outside parties; in other words, a leased wire, either telegraph, telephone, or teletype, with all intermediate reporting points tied in with the main or control stations.

Let us consider briefly what this proposed plan for meeting the needs of airways entails in the way of new service. There is already in existence the primary network of stations for the 12 or 6 hour reports. And, as earlier indicated, the airways themselves are quite well provided with intermediate stations for the hourly reports.

It appears that the principal expansion will be required in connection with the 3-hour reports from points off the airways. Attention is called to the accompanying map (fig. 3) on which are indicated the points from or near which it is believed that 3-hour reports should be available for service on the airways that are now equipped for night as well as day flying. Symbols on the map show points at which there are now Weather Bureau stations. Additional personnel would of course be required at these stations. In the case of the other places it would be necessary to appoint special observers.

It will be noted that the points selected are on the average about 100 miles apart in lines more or less parallel to the airways and at a distance from them of about 100 to 200 miles. Many of the stations would serve two or more airways that have a common terminal. Thus, the number of stations required is not in strict ratio to the total mileage. In the proposed set-up 116 stations would serve 7,700 miles of airways, although the average distance between the stations is approximately 100 miles.

The proposed extension will cost considerable money. But so does a passenger plane. So does the operation of a lighting system for night flying. So do airports. The prevention of the crash of one plane filled with passengers, or the increase in efficiency; that is, the increase in arrivals on schedule, by 2 or 3 per cent, would more than justify the cost, which after all would be but an infinitesimal fraction of the total amount involved in commercial aeronautics.

One of the important by-products of intensive service such as that proposed would be its application to all other lines of industrial and commercial activity. People have gotten along with forecasts expressed in general terms, for 12 to 36 hours in advance, because there was nothing else available. These must be continued, of course, as they serve many purposes. But of much greater utility would be forecasts for short periods in advance couched in terms that would naturally be much more definite and precise than are those we now have. Thus anyone asking at 1 p. m. what the weather will be at 3 p. m. would be given a forecast based on reports recently received instead of those in the early morning. As the airways are extended to include all parts of the country, these secondary nets of reporting stations would provide data for relatively precise, short-period forecasts that would vastly increase the utility of weather service not only for the operation of airways but also for all fields of human endeavor.

THE WEATHER OF 1928 IN THE UNITED STATES

By ALFRED J. HENRY

The year 1928 has passed into history with a favorable record so far as the average distribution of temperature and precipitation, the two elements upon which success or failure in crop production greatly depend, are concerned.

Chart 1 shows that the mean annual temperature for the greater part of the country was above the normal, especially in the Plains States from the Dakotas to the Gulf of Mexico.

The numerical values in the form of district average departure from the normal for both temperature and precipitation are given in Tables 1 and 2.

Chart 2 shows that for the United States as a single geographic unit precipitation was close to the normal, some districts, the East Gulf States, the Atlantic seaboard south of New England, the States of Kansas, Missouri, Iowa, Oklahoma, and parts of the surrounding area received greater than the normal rainfall.

Large areas in the Ohio Valley, the West Gulf States, the plateau region west of the Rockies, and the Pacific Coast States received less than the normal.

The weather of the year was conditioned upon the frequency and intensity of extra tropical cyclones and anticyclones which traversed continental United States. The excessive precipitation along the Atlantic seaboard was due to the passage of two tropical cyclones in very nearly the same path. One of these caused great destruction of property and large loss of life in Florida. The number of these barometric formations is given in Table 3.

One hundred and sixty-one tornadoes, great and small, were reported during the year. The Rockford, Ill., tornado of September 14 caused a loss of life of 14 and the injury of 100 persons, this being the greatest casualties in any single storm.

TABLE 1.—*Monthly and annual temperature departures, 1928*

Districts	January	February	March	April	May	June	July	August	September	October	November	December	Average monthly departure
New England	+3.9	+0.9	+0.4	−1.2	−1.3	−1.9	+0.9	+2.9	−2.0	+1.5	+1.8	+5.3	+0.9
Middle Atlantic	+2.5	+1.6	+0.5	−1.8	−1.6	−1.8	+0.7	+2.2	−2.9	+1.9	+2.6	+3.1	+0.6
South Atlantic	0.0	+0.1	+0.8	−1.7	−2.3	−0.2	+0.5	+1.4	−1.2	+2.7	+0.4	+0.6	+0.2
Florida Peninsula	−2.9	+2.0	+1.3	+0.2	−1.8	−0.1	+0.6	+0.2	+0.2	+1.3	−0.7	−0.4	±0.0
East Gulf	−0.9	−1.2	+0.6	−3.4	−1.9	−1.3	+0.2	+1.5	−1.1	+3.2	−0.7	−0.2	−0.4
West Gulf	+1.7	+0.5	+1.7	−4.3	−0.1	−1.3	+0.3	+2.0	−1.6	+4.0	−0.9	−0.1	+0.2
Ohio Valley and Tennessee	+0.4	+0.5	−0.9	−3.6	−2.1	−4.3	−0.1	+1.4	−3.8	+2.8	+0.8	+2.2	−0.6
Lower Lakes	+2.2	+1.4	−0.3	−2.4	−1.3	−3.9	+0.6	+2.5	−3.1	+2.6	+2.8	+4.4	+0.5
Upper Lakes	+2.5	+2.0	+0.6	−3.5	+0.5	−4.0	−0.1	+1.0	−3.7	+1.6	+2.4	+3.8	+0.3
North Dakota	+8.8	+11.5	+6.2	−4.8	+5.0	−4.4	−0.6	−0.6	−2.8	+0.5	+4.9	+8.5	−2.7
Upper Mississippi Valley	+4.4	+5.4	+3.2	−4.4	+1.7	−5.0	+0.4	+0.9	−3.5	+2.7	+2.3	+4.2	+1.0
Missouri Valley	+6.3	+6.5	+5.3	−3.8	+3.0	−4.8	+0.3	+1.3	−2.4	+2.3	+1.4	+4.9	+1.7
Northern Slope	+5.4	+3.2	−4.8	−2.7	−4.8	−4.5	+0.1	−1.2	−0.4	+0.3	+1.3	−0.6	−0.8
Middle Slope	+6.0	+2.9	−3.1	−2.8	+1.1	−4.5	−0.4	+0.2	−0.4	+2.0	−0.4	+1.8	−0.1
Southern Slope	+2.2	+0.3	+2.8	−2.0	−0.3	+1.0	+0.5	−0.9	−0.7	+3.5	−1.7	+0.2	−0.4
Southern Plateau	+2.6	+0.2	+3.4	+0.2	+2.3	+0.6	+1.3	−0.2	+2.2	+2.0	−0.2	−0.5	−1.2
Middle Plateau	+2.3	+2.6	+3.5	−1.4	+5.7	−0.4	+1.9	+0.2	+2.5	+1.3	+0.1	−3.2	+1.3
Northern Plateau	+0.6	+0.2	+2.8	−2.4	+6.1	−0.7	+3.3	−0.2	+2.1	+1.4	+0.4	−2.7	+0.1
North Pacific	+2.1	+2.0	−3.6	±0.0	+3.5	−0.5	+1.6	±0.0	−0.2	+0.4	+1.2	−0.4	+0.5
Middle Pacific	+0.7	+1.9	+3.4	+0.5	+3.0	+1.3	+0.1	−0.2	+0.4	−0.7	−0.6	−2.1	+0.4
South Pacific	+3.6	+2.7	+3.4	+1.7	+3.0	−0.4	−0.8	−0.9	+1.1	−0.8	+0.9	+0.1	+1.1
UNITED STATES	+2.1	+2.2	+1.3	−2.1	+0.8	−2.0	−0.5	+0.6	−1.0	+1.7	+0.9	+1.4	[1] +0.1

[1] Annual departure.

TABLE 2.—*Monthly and annual precipation departures, 1928*

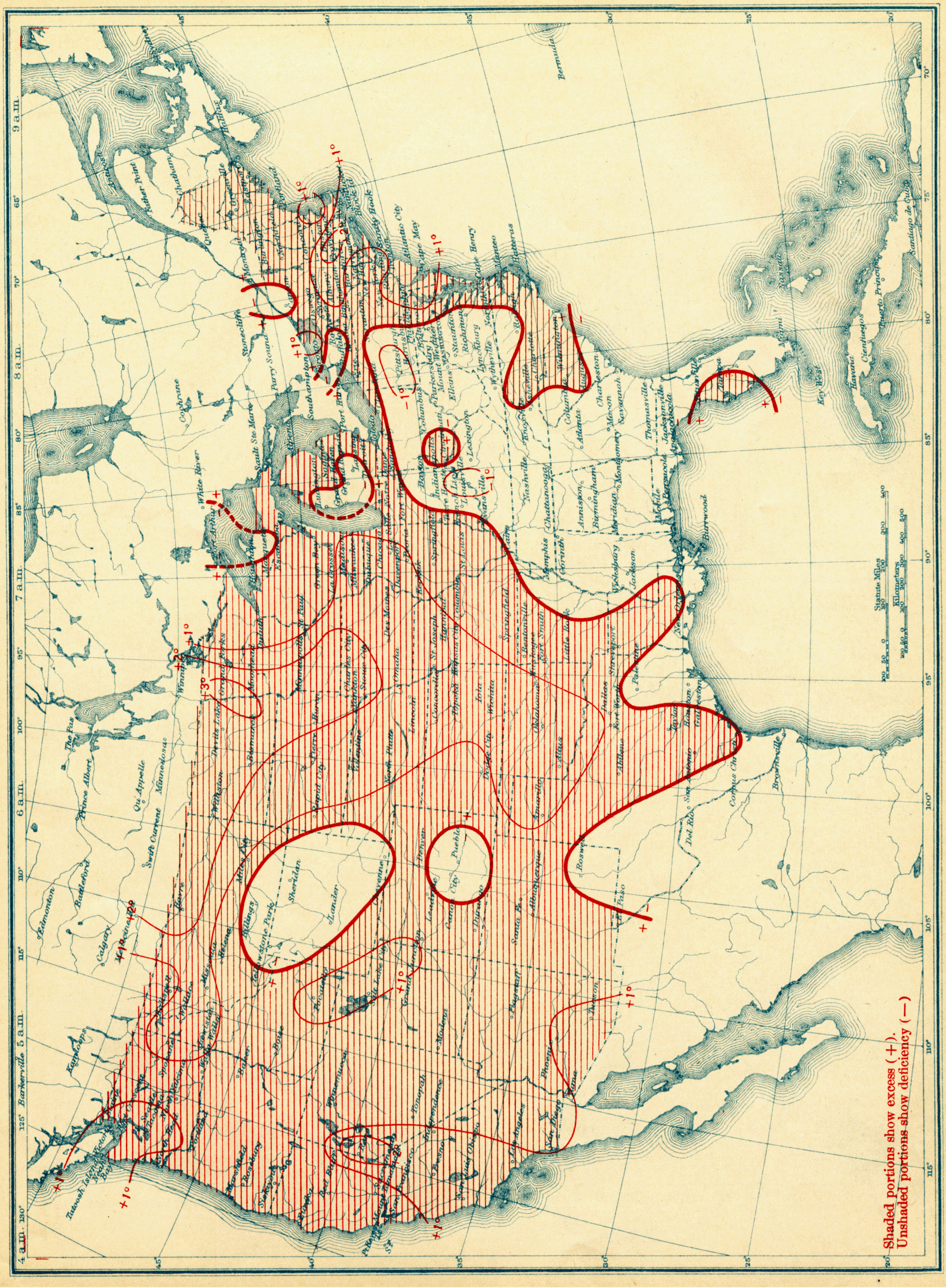
District	January	February	March	April	May	June	July	August	September	October	November	December	Accumulated departures for the year
New England	−1.1	−0.3	−1.0	+0.8	−0.5	+1.2	+0.6	−0.3	+1.1	−1.3	−0.8	−1.2	−2.7
Middle Atlantic	−1.1	−0.3	−0.9	+2.0	−0.9	+2.5	+0.2	+1.7	+1.6	−2.1	−0.8	−1.7	−3.6
South Atlantic	−2.5	+1.2	−0.1	+3.0	±0.0	−1.2	−0.7	+1.5	+7.9	−1.7	−1.1	−0.8	+5.5
Florida Peninsula	−2.1	−1.3	−1.1	±0.0	+0.6	+0.1	−2.7	+1.1	+4.1	−2.3	−1.3	−0.7	−5.6
East Gulf	−3.5	−0.6	+0.5	+3.9	−0.3	+4.0	+0.4	+2.1	−0.5	±0.0	−1.2	−1.9	+2.9
West Gulf	−1.8	+0.8	−1.4	−0.3	−0.9	+1.9	−0.8	−0.7	+1.0	+0.1	+0.1	+1.0	−1.0
Ohio Valley and Tennessee	−1.9	−0.9	−1.3	+0.8	−0.7	+4.5	−0.1	+0.1	−1.6	+1.1	±0.0	−1.4	−1.4
Lower Lakes	−0.7	−0.4	−0.1	+0.1	−1.4	+1.5	+0.8	−0.1	−1.0	±0.0	+0.5	−1.5	−3.3
Upper Lakes	−0.5	−0.4	−0.3	+0.4	−1.2	+1.8	−0.2	+1.0	−0.1	+0.7	+0.2	−0.6	+0.8
North Dakota	−0.4	−0.4	−0.4	−0.7	−1.3	+0.8	+2.6	+1.2	−0.5	−0.8	−0.2	−0.2	−0.3
Upper Mississippi Valley	−1.0	+0.4	−0.8	−0.1	−1.6	+1.4	+0.4	+2.4	−1.0	+1.2	+1.4	−0.1	−2.6
Missouri Valley	−0.8	+0.3	−0.9	−0.8	−1.4	+2.0	−0.3	+0.5	−1.1	+0.8	+2.2	−0.1	+0.4
Northern Slope	−0.4	−0.4	−0.2	−0.8	−0.9	+1.3	+0.7	−0.5	−0.8	+0.4	±0.0	−0.4	−2.0
Middle Slope	−0.5	+0.5	+0.1	+0.2	−0.9	+2.0	±0.0	−0.4	−1.4	+0.6	+1.8	±0.0	−2.0
Southern Slope	−0.3	±0.0	−0.5	−1.1	+3.3	−0.5	−0.2	+2.2	±0.0	+0.2	±0.0	−0.3	−2.8
Southern Plateau	−0.7	+0.3	−0.1	±0.0	+0.5	−0.4	−0.8	+0.3	−0.7	+0.4	−0.1	−0.3	−1.0
Middle Plateau	−0.7	−0.9	+0.7	−0.4	−0.1	−0.1	−0.1	−0.3	−0.5	+0.3	±0.0	−0.3	−2.4
Northern Plateau	+0.2	−1.1	+0.4	−0.4	−1.3	−0.3	+0.2	−0.4	−0.4	−0.4	−0.6	−0.6	−4.7
North Pacific	−0.7	−3.3	+2.9	+0.8	−1.4	−1.1	−0.3	−0.7	−1.3	+0.5	−2.3	−2.8	−9.7
Middle Pacific	−2.6	−2.1	+0.8	+0.2	−0.9	−0.2	±0.0	±0.0	−0.5	−0.8	+1.1	+0.1	−4.9
South Pacific	−2.1	−1.2	−0.7	−0.7	−0.2	−0.1	±0.0	±0.0	−0.2	−0.5	+0.3	+0.2	−5.2
UNITED STATES	−1.2	−0.5	−0.2	+0.3	−0.5	+1.0	±0.0	+0.5	+0.2	−0.2	±0.0	−0.6	−1.2

TABLE 3.—*Number of cyclones and anticyclones*[1] *plotted in 1928, with apparent place of origin*

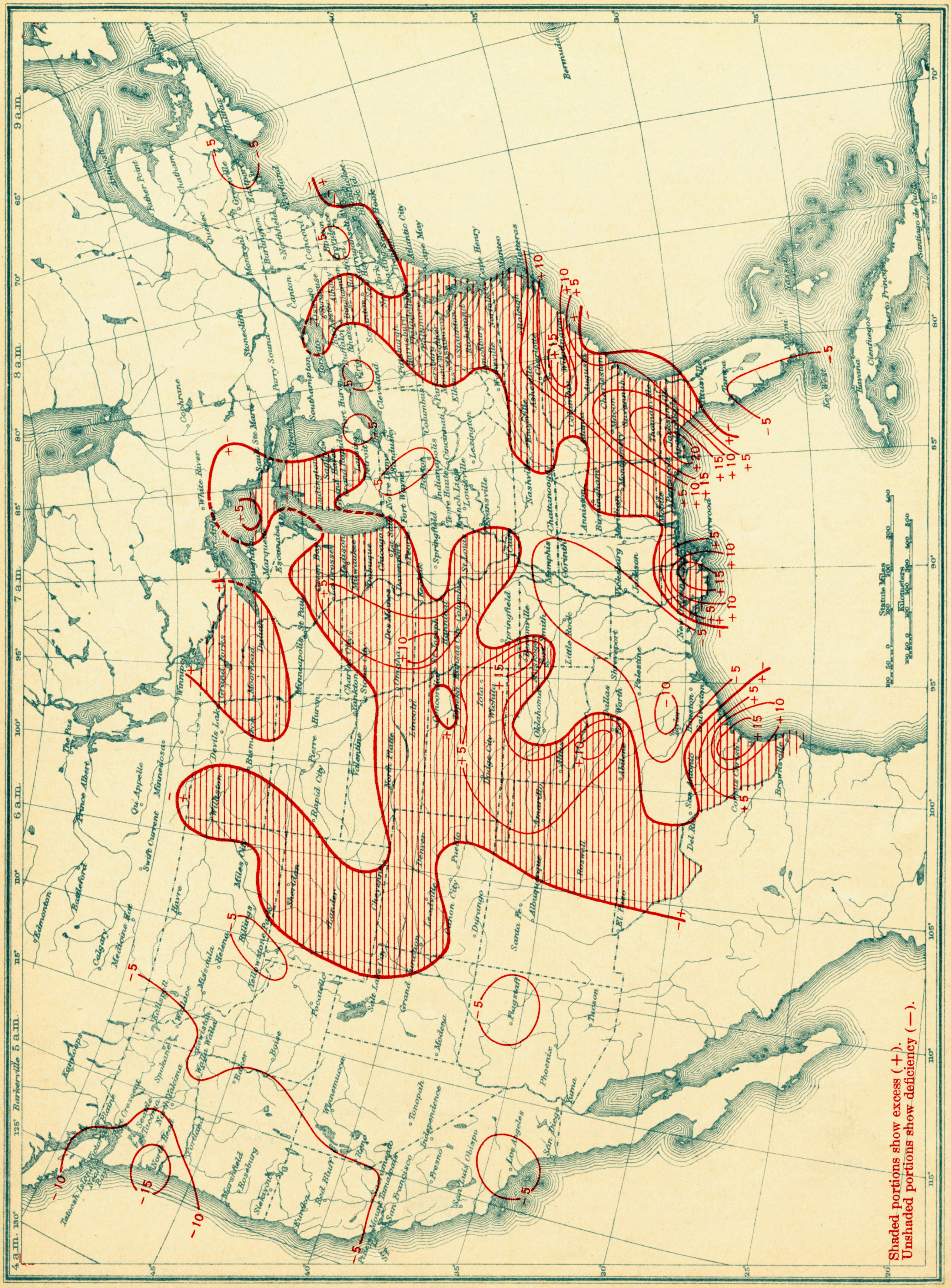
	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Extra tropical cyclones:													
Canada	8	7	4	3	5	2	2	0	4	7	5	5	52
Northern Pacific	0	2	2	2	1	0	0	0	0	0	2	3	12
United States	7	5	7	9	9	7	7	9	8	7	3	2	80
Tropical cyclones								3	1				4
Total	15	14	13	14	15	9	9	12	13	14	10	10	148
Anticyclones:													
Canada	4	5	7	7	7	1	6	3	6	5	5	1	57
Northern Pacific	3	5	1	1	3	0	0	0	2	0	2	2	19
United States	6	3	2	2	3	4	3	7	3	8	3	3	47
Total	13	13	10	1 0	13	5	9	10	11	13	10	6	123

[1] Including secondaries of both but does not include cyclones that traversed the Atlantic off the east coast of United States.

A. J. H. **I. Annual Temperature Departures (°F.) in the United States, 1928**



A. J. H. II. Annual Precipitation Departures (inches) in the United States, 1928



Shaded portions show excess (+).
Unshaded portions show deficiency (−).